

## Logic Families

## - Improved TTL series :

## \* 74H XX (high speed TTL) :

- reduce the internal resistor.
- increase consumption.
- Propagation delay =  $\frac{1}{2} t_P$  for fundamental.

## \* 74L XX (Low Power TTL) :

- increase internal resistor
- Decrease consumption

## - Schotky TTL : (74S XX)

ON  $\rightarrow$  0.3 VEquivalent circuit  $\Rightarrow$  schotky transistor

## \* 74LS XX (Low Power schotky TTL)

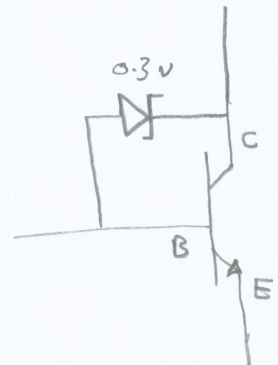


schotky transistor

## \* 74ALS XX (Advanced Low Power schotky TTL) :

propagation delay = 4 ns

Power dissipation = 1 mW



CMOS family : (Complementary Metal oxide semiconductor)

MOSFET  $\begin{cases} \text{N-MOSFET} \\ \text{P-MOSFET} \end{cases} \Rightarrow \begin{matrix} \text{LSI} \\ \text{VLSI} \end{matrix}$

$\begin{cases} V_{GS} > 0 \Rightarrow \text{ON} \\ V_{GS} \leq 0 \Rightarrow \text{off} \end{cases} \quad (\text{N-MOSFET})$

$\begin{cases} V_{GS} \leq 0 \Rightarrow \text{ON} \\ V_{GS} > 0 \Rightarrow \text{off} \end{cases} \quad (\text{P-MOSFET})$

CMOS : (  $V_{DD} \rightarrow 3\text{V} : 15\text{V}$  )

$V_{in} \rightarrow \text{Logic 1}$

N-MOSFET  $\rightarrow \text{ON}$

P- " "  $\rightarrow \text{off}$

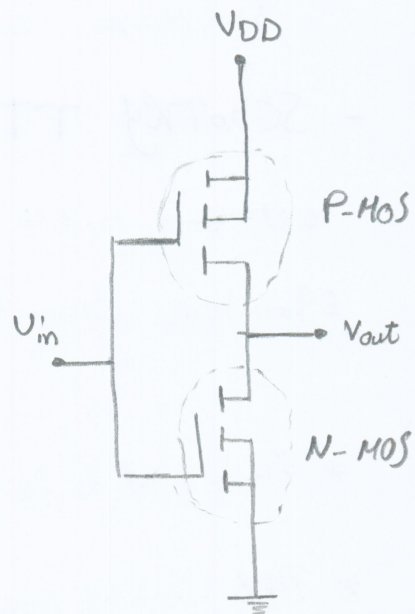
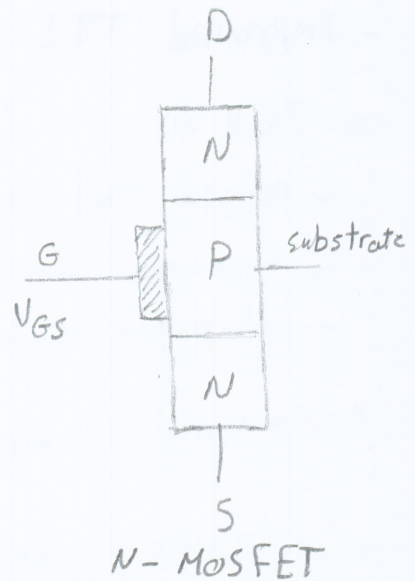
$V_{out} \rightarrow \text{Logic 0}$

$V_{in} \rightarrow \text{Logic 0}$

P-MOSFET  $\rightarrow \text{ON}$

N- " "  $\rightarrow \text{off}$

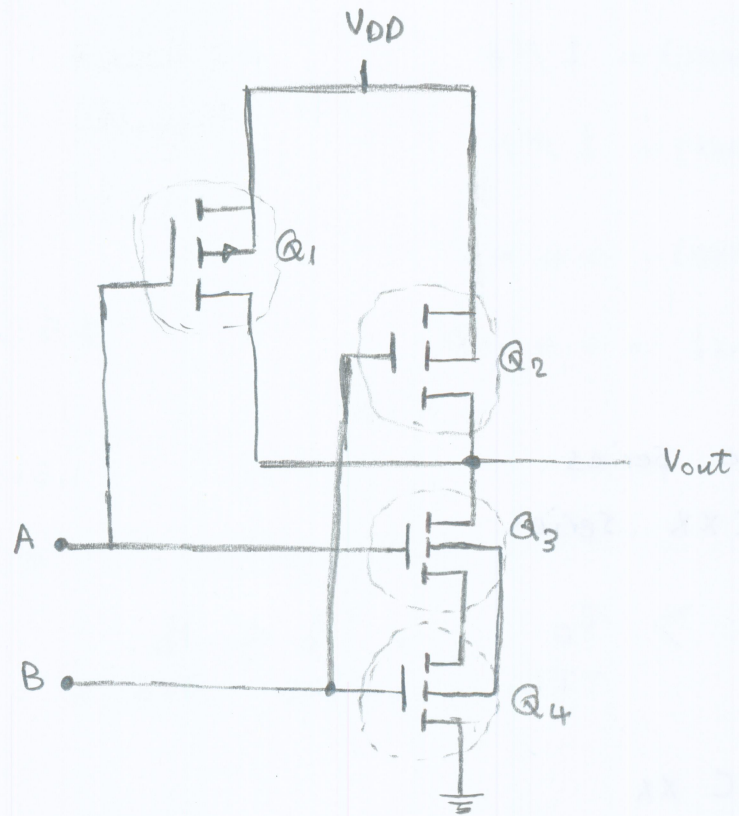
$V_{out} \Rightarrow V_{DD}$





## CMOS - NAND gate :

\* operation Report



Voltage & Current rating :

$$I_{IH} (\text{max}) = 1 \text{ mA}$$

$$I_{IL} (\text{max}) = 1 \text{ mA}$$

$$I_{OH} (\text{max}) = 0.4 \text{ mA}$$

$$I_{OL} (\text{max}) = 0.4 \text{ mA}$$

\* 4000 Series

\* 74CXX Series

$$t_D \underset{\text{C-MOS}}{>} \underset{\text{TTL}}{t_D}, \quad P_D \underset{\text{C-MOS}}{<} \underset{\text{TTL}}{P_D}$$

\* 74LCXX

\* 74-Bi-CMOS (TTL - CMOS)  $t_P \rightarrow 2.9 \text{ nsec}$

\* 74HCXX / 74HCTXX (High Speed / High speed compatible with TTL)

\* 74VHCXX / 74VHCTXX

\* 74-Low Voltage Series (Power supply  $\leq 3.3 \text{ V}$ )

for notebook & mobile phones

- 74LVC (Low voltage CMOS)

- 74LVT (Low Voltage Technology)

74HLV (High Speed - Low voltage)

